

REMARKS

The Office Action mailed December 15, 2004, has been received and reviewed. Claims 1 through 21 are currently pending in the application. Claims 1 through 21 stand rejected. Reconsideration is respectfully requested.

Double Patenting Rejection Based on U.S. Patent No. 6,693,366

Claims 1 through 21 stand rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 through 46 of U.S. Patent No. 6,693,366. In order to avoid further expenses and time delay, Applicant elects to expedite the prosecution of the present application by filing a terminal disclaimer to obviate the double patenting rejections in compliance with 37 CFR §1.321 (b) and (c). Applicant's filing of the terminal disclaimer should not be construed as acquiescence in the Examiner's double patenting or obviousness-type double patenting rejections. Attached are the terminal disclaimer and accompanying fee.

35 U.S.C. § 102(b) Anticipation Rejections**Anticipation Rejection Based on U.S. Patent No. 5,318,803 to Bickford et al.**

Claims 1, 2, 8, 11, 12, 14, 18, 19 and 21 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Bickford et al. (U.S. Patent No. 5,318,803). Applicant respectfully traverses this rejection, as hereinafter set forth.

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Brothers v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Bickford discloses a method of conditioning a substrate for electroless plating by contacting the substrate with a metal salt *and then* with a reducing agent. (Bickford, Abstract)(emphasis added). By way of contrast, claim 1 of the presently claimed invention recite, a "semiconductor device structure comprising an oxidation barrier, the oxidation barrier comprising a doped metal or doped metal alloy layer co-deposited by electroless plating."

Applicant respectfully submits that Bickford fails to disclose, either expressly or inherently, every element of claim 1 of the presently claimed invention. Specifically, Bickford fails to disclose an “oxidation barrier comprising a doped metal or doped metal alloy layer *co-deposited* by electroless plating.” Bickford does not disclose a doped metal layer. Further, the metal layers in Bickford are not co-deposited. A co-deposited doped metal or a co-deposited doped metal alloy layer possesses *different physical characteristics* than the homogenous metal layers of Bickford. Applicant submits a doped layer may have forced segregation of the dopant to grain boundaries of the surface of the layer. *See*, Younan et al. “Effect of Heat Treatment on Electroless Ternary Nickel-Cobalt-Phosphorus Alloy”, *J. of Applied-Electrochem.*, 32: 439-446 (2002), submitted with the Information Disclosure Statement of August 20, 2003. Younan states the “interpolar distance of nickel metal is widened by cobalt codeposition and indicate that the as plated Ni-Co-P alloy is a supersaturated solid solution of P and Co dissolved in a microcrystalline Ni matrix with (1 1 1) preferred direction.” (Younan, page 4, left column).

The dopant in a co-deposited layer may be found within interstitial sites of a layer. As described in Younan, phosphorus (from the reducing agent hypophosphite $\text{H}_2\text{PO}_2^{2-}$) does not form a chemical compound (such as TiSi) but forms a supersaturated solution. (Younan, page 4, left column and page 7, right column). Further, Younan discusses that segregation can be forced upon heat treatment. (*Id.*) Younan also discusses additional changes that occur with the crystalline structure upon heating. (Younan, page 5 and Fig. 4). The article explains that heating a codeposited structure alters the crystal orientation through, for example, absorption of atoms into recrystalline nickel matrices which widen the interplanar spacing of nickel metal. (*Id.*) Accordingly, as a co-deposited doped metal or a co-deposited doped metal alloy layer would possess different physical characteristics than the metal layer in Bickford and Bickford fails to disclose every element of the presently claimed invention.

As Bickford does not disclose an “oxidation barrier comprising a doped metal or doped metal alloy layer *co-deposited* by electroless plating,” it cannot anticipate claim 1 of the presently claimed invention. Accordingly, claim 1 is allowable.

Claim 2 is allowable at least as depending from allowable claim 1.

Claim 2 is further allowable as Bickford fails to disclose, either expressly or inherently, a

doped metal or doped metal alloy layer.

Independent claims 8 and 18 are each allowable at least for the reasons stated for claim 1 herein. Bickford fails to disclose, either expressly or inherently, “forming an oxidation barrier comprising co-depositing a doped metal or doped metal alloy layer by electroless plating over a semiconductor substrate” or an “electroless plating bath for depositing an oxidation barrier on a semiconductor device structure, the bath comprising at least one metal salt and at least one substance that alters a grain structure of a metal of the at least one metal salt” as recited in claims 8 and 18 of the presently claimed invention.

Bickford lacks any disclosure of co-depositing a doped metal or doped metal alloy layer by electroless plating and expressly teaches coating a substrate with a metal salt *before* introducing the substrate to an electroless plating bath. (See, Bickford, col. 4, lines 16-52). The Specification discloses that “the reaction between one of more metal salts and one or more reducing agents may result in the introduction of impurities, referred to as ‘dopants’, into the metal layers as the metal layers are formed. Thus, the metal and dopant are said to be ‘co-deposited’” (Specification, [0028]). Applicant respectfully submits that Bickford fails to disclose, either expressly or inherently, the use of a metal salt and a reducing agent in the electroless plating bath. Instead, Bickford expressly discloses a multi-step process where a substrate is first contacted with a metal salt. *Next*, the substrate with a metal layer is contacted with an electroless metal plating bath containing a reducing agent. (See, Bickford, col. 4, lines 16-52). Bickford also discloses contacting the substrate with a second metal salt *after* the electroless plating bath. (Bickford, col. 7, lines 36-37). Even claim 1 of Bickford expressly contemplates that the substrate is *not* simultaneously exposed to the metal salt and reducing agent. As Bickford does not disclose “forming an oxidation barrier comprising co-depositing a doped metal or doped metal alloy layer by electroless plating over a semiconductor substrate” it cannot anticipate claim 8 of the presently claimed invention. Accordingly, claim 8 is allowable.

Claims 11-12 and 14 are each allowable as depending from allowable claim 8.

Claim 11 is further allowable because Bickford fails to disclose, either expressly or inherently, introducing at least part of the semiconductor substrate into an aqueous metal solution comprising at least one metal salt and at least one reducing agent.

Claim 14 is further allowable because Bickford fails to disclose, either expressly or inherently, introducing at least part of the semiconductor substrate into an aqueous metal solution comprising at least one metal salt and at least one substance that alters a grain structure of a metal of the at least one metal salt.

As Bickford does not disclose an “electroless plating bath for depositing an oxidation barrier on a semiconductor device structure, the bath comprising at least one metal salt and at least one substance that alters a grain structure of a metal of the at least one metal salt” it cannot anticipate claim 18 of the presently claimed invention. Bickford expressly discloses contacting a substrate with a metal salt and then introducing the substrate to an electroless bath. Bickford does not disclose a single bath including both at least one metal salt and at least one substance that alters a grain structure of a metal of the at least one metal salt. As Bickford fails to disclose every element of the presently claimed invention, claim 18 is allowable.

Claims 19 and 21 are each allowable as depending from allowable claim 18.

While not an express rejection, applicants respectfully disagree with the Examiner’s statement that U.S. Patent 5,332,646 to Wright et al. discloses claims 1, 2, 8, 11-12, 14, 18, 19 and 21 of the presently claimed invention. Wright discloses a method of preparing a colloidal metal dispersion for use as toner fluid. Thus, Wright fails to disclose the semiconductor device of claim 1, the method of forming an oxidation layer of claim 8, the electroless plating bath of claim 18 or the limitations of the dependent claims. Accordingly, Wright cannot anticipate the claims of the presently claimed invention.

35 U.S.C. § 103(a) Obviousness Rejections

Obviousness Rejection Based on U.S. Patent No. 5,318,803 to Bickford et al.

Claims 3 through 7, 9, 10, 13, 15, 16, 17 and 20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Bickford et al. (U.S. Patent No. 5,318,803). Applicant respectfully traverses this rejection, as hereinafter set forth.

M.P.E.P. 706.02(j) sets forth the standard for a Section 103(a) rejection:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must

be a reasonable expectation of success. Finally, **the prior art reference (or references when combined) must teach or suggest all the claim limitations.** The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). (Emphasis added).

The Court of Appeals for the Federal Circuit has stated that "dependent claims are nonobvious under section 103 if the independent claims from which they depend are nonobvious." *In re Fine*, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988). See also MPEP § 2143.03. Having failed to teach or suggest each and every limitation of the independent claims, the prior art referenced as rendering dependent claims 3 through 7, 9, 10, 13, 15, 16, 17 and 20 obvious, cannot serve as a basis for rejection.

Claims 3 and 5 are further allowable because Bickford fails to disclose, either expressly or inherently, a doped metal or doped metal alloy layer.

Claim 4 is further allowable because Bickford fails to disclose, either expressly or inherently, that boron comprises about 0.1% to about 5.0% by weight of the doped metal or doped metal alloy layer.

Claim 6 is further allowable because Bickford fails to disclose, either expressly or inherently, that the doped metal or doped metal alloy layer has a thickness of about 500Å.

Claim 7 is further allowable because Bickford fails to disclose, either expressly or inherently, that the doped metal or doped metal alloy layer has a thickness of about 100Å.

Claim 9 is further allowable because Bickford fails to disclose, either expressly or inherently, forming a conductive structure over the oxidation barrier.

Claim 10 is further allowable because Bickford fails to disclose, either expressly or inherently, forming a dielectric layer over the oxidation barrier.

Claim 13 is further allowable because Bickford fails to disclose, either expressly or inherently, introducing at least part of the semiconductor substrate into an aqueous metal solution comprising at least one metal salt and at least one of dimethylaminoborane, borohydride, and hydrazine.

Claim 15 is further allowable because Bickford fails to disclose, either expressly or inherently, forming an oxidation barrier comprising a boron-doped metal.

Claim 16 is further allowable because Bickford fails to disclose, either expressly or inherently, forming an oxidation barrier comprising a phosphorous-doped metal.

Claim 17 is further allowable because Bickford fails to disclose, either expressly or inherently, forming an oxidation barrier adjacent a conductive layer on the semiconductor substrate.

Claim 19 is further allowable because Bickford fails to disclose, either expressly or inherently, that the at least one metal salt comprises a salt of at least one of platinum, rhodium, iridium, ruthenium, and palladium.

Claim 20 is further allowable because Bickford fails to disclose, either expressly or inherently, that the at least one substance that alters the grain structure of the metal of the at least one metal salt comprises at least one of dimethylamineborane, potassium borohydride, sodium borohydride, and hydrazine.

CONCLUSION

Claims 1-21 are believed to be in condition for allowance, and an early notice thereof is respectfully solicited. Should the Examiner determine that additional issues remain which might be resolved by a telephone conference, he is respectfully invited to contact Applicant's undersigned attorney.

Respectfully submitted,



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